

REMARKS

Reconsideration and allowance are respectfully requested in light of the preceding amendments and following remarks. No claims having been cancelled and claims 19-21 having been added by this response, the Applicants respectfully submit that 21 claims, specifically claims 1-21, of which claims 1 and 19 are independent, remain pending and properly under consideration in this application.

35 U.S.C. § 103(a) Rejections Based On XU And DAI References

Claims 1, 2, 4, 5, 9-12, 15 and 16 stand rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Pat. No. 5,973,444 to Xu et al. ("Xu") in view of U.S. Pat. No. 6,232,706 to Dai et al. ("Dai"). The Applicants respectfully traverse this rejection.

The Applicants respectfully submit that as described by Xu, FIG. 1 illustrates a device 10 in which carbon fiber emitters 20 are grown catalytically from the surface of a patterned metal catalyst film 14. Contrary to the assertion, Action at 2, the Applicants respectfully contend that there is no teaching or suggestion in the cited portions of Xu that the metal catalyst film is a "composite material" as that term is used in the present application or that any portion of the carbon fibers formed thereon extend into the metal catalyst film to become a part of any composite material.

The Applicants also respectfully submit that there is no textual or logical support for the assertion that the metal catalyst(s) used to promote the growth of the carbon fibers produce even a partial "coating" of the final carbon fibers. Indeed, the Applicants respectfully contend that the term "coating" requires a "thin layer" on a substrate and that a catalyst particle found at the end of a carbon fiber cannot, under any reasonable

interpretation, constitute a "coating" as that term is used in the present application. Col. 9, lines 49-51. The Applicants respectfully contend, therefore, that the Examiner has not provided the necessary "convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985).

The Applicants also respectfully submit that as used in the present application and claims, the term "protrude" refers to that portion of the claimed nanowires that are not incorporated into the composite material. In Xu, however, no portion of the carbon fibers 20 are incorporated into the patterned metal catalyst film 14 or any underlying layer and thus do not "protrude" from a composite material as required by claim 1. The Applicants respectfully contend that Xu's preference for carbon fibers having an aspect ratio of more than 4 does not remedy this deficiency.

Contrary to the assertion, Action at 3, the Applicants respectfully contend that as detailed above there are material differences between the disclosure of Xu and claim 1 other than the length of the nanowires. The Applicants also respectfully contend that Dai, like Xu, is directed to the catalytic growth of carbon fibers from a layer of a catalyst material and does not, therefore, teach or suggest the inclusion of the carbon fibers in a composite material as required by claim 1. The Applicants further contend that Dai does not remedy the noted deficiencies of the primary Xu reference and that the proposed combination is not, therefore, sufficient to teach or suggest the claimed invention to one of ordinary skill in the art.

With respect to claim 2, the insufficiencies detailed above regarding the proposed combination of the Xu and Dai references are equally applicable to dependent claim 2

and are incorporated by reference. The Applicants respectfully contend that the material differences noted between the claimed invention and the actual teachings of the cited references are not overcome by Xu's disclosure of field emission devices in which the carbon fibers comprise a portion of the electron emitter structure.

With respect to claims 4 and 5, the insufficiencies detailed above regarding the proposed combination of the Xu and Dai references are equally applicable to dependent claims 4 and 5 and are incorporated by reference. As noted above, the Applicants respectfully contend that the cited references fail to teach or suggest any "coating" of the carbon fibers. The Applicants respectfully contend that the Examiner has identified no basis for finding the magnetic material content comprises a result-effective variable suitable for optimization. Indeed, it is the Applicants' position that nothing in the cited references would have led one of ordinary skill to coat the carbon fibers with *any* magnetic material, let alone select the claimed volume percent ranges. Absent identification of a particular parameter as a result-effective variable, *i.e.*, a variable which achieves a recognized result, there can be no "routine" experimentation to determine the optimum or workable ranges of that variable. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977). The Applicants respectfully contend, therefore, that the material differences noted between the claimed invention and the actual teachings of the cited references cannot be overcome by "routine experimentation."

With respect to claim 9, the insufficiencies detailed above regarding the proposed combination of the Xu and Dai references are equally applicable to dependent claim 9 and are incorporated by reference. As noted above, the Applicants respectfully contend that the cited references fail to teach or suggest any "protruding" of the carbon fibers

from a composite material. The Applicants respectfully contend that the Examiner has identified no basis for finding the percentage variation in the protrusion height comprises a result-effective variable. As noted above, absent such a finding, the assertion of “routine experimentation” for meeting a claim limitation not found or suggested in the prior art references is inappropriate.

With respect to claim 10, the insufficiencies detailed above regarding the proposed combination of the Xu and Dai references are equally applicable to dependent claim 10 and are incorporated by reference. As noted above, the Applicants respectfully contend that the cited references fail to teach or suggest any “composite material” as that term is used in the present application and claims. In particular, the Applicants respectfully contend that the catalyst metal film 14 of Xu does not comprise a “composite material” incorporating carbon nanowires.

With respect to claim 11, the insufficiencies detailed above regarding the proposed combination of the Xu and Dai references and the arguments specific to claim 2 are equally applicable to dependent claim 11 and are incorporated by reference. The Applicants respectfully contend that the material differences noted between the claimed invention and the actual teachings of the cited references are not overcome by Xu’s disclosure of field emission devices in which the carbon fibers comprise a portion of the electron emitter structure.

With respect to claim 12, the insufficiencies detailed above regarding the proposed combination of the Xu and Dai references and the arguments specific to claims 2 and 11 are equally applicable to dependent claim 12 and are incorporated by reference. The Applicants respectfully contend that the material differences noted

between the claimed invention and the actual teachings of the cited references are not overcome by Xu's disclosure of field emission devices in which the carbon fibers comprise a portion of the electron emitter structure with an apertured grid.

With respect to claim 15, the insufficiencies detailed above regarding the proposed combination of the Xu and Dai references are equally applicable to dependent claim 15 and are incorporated by reference. The Applicants respectfully contend that the material differences noted between the claimed invention and the actual teachings of the cited references are not overcome by Xu's disclosure that the carbon fibers are made of carbon.

With respect to claim 16, the insufficiencies detailed above regarding the proposed combination of the Xu and Dai references are equally applicable to dependent claim 16 and are incorporated by reference. The Applicants respectfully contend that the material differences noted between the claimed invention and the actual teachings of the cited references are not overcome by Xu's disclosure that the carbon fibers may contain particles of the metal catalysts. The Applicants respectfully maintain that there is no teaching or suggestion that the catalyst metal comprises even a partial coating or that such catalyst metals are "inside," Action at 5, the carbon fiber.

The Applicants, therefore, respectfully request that these rejections be withdrawn.

35 U.S.C. § 103(a) Rejections Based On XU, DAI And DEBE References

Claim 3 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Xu, in view of Dai and further in view of U.S. Pat. No. 5,276,524 to Debe ("Debe"). The Applicants respectfully traverse this rejection.

With respect to claim 3, the insufficiencies detailed above regarding the proposed combination of the Xu and Dai references are equally applicable to dependent claim 3 and are incorporated by reference. The Applicants respectfully contest the Examiner's interpretation of Debe. As made clear in the cited section:

The microstructures of the preferred embodiment can be made to have random orientations by control of the substrate temperature during the deposition of the initial PR149 layer, as described above. They can also be made to have curvilinear shapes by conditions of the conformal coating process. As discussed in FIG. 6 of L. Aleksandrov, "GROWTH OF CRYSTALLINE SEMICONDUCTOR MATERIALS ON CRYSTAL SURFACES," Chapter 1, Elsevier, New York, 1984, the energies of the arriving atoms applied by different coating methods, e.g., thermal evaporation deposition, ion deposition, sputtering and implantation, can range over 5 orders of magnitude. The higher energy processes can cause the PR149 whiskers to deform during the conformal coating process, such as shown in FIG. 8 of the invention Drawing. This effect can be an advantage for field emission from microstructures having multiple potential emission sites on their surfaces in the form of nanoscopically rough features, *since as the tips curl over*, more of the potential emission sites will be positioned appropriately for field emission towards a cathode.

Debe, col. 12, lines 27-46 (emphasis added), and illustrated in FIG. 8, the "deformed" whiskers are bent, not broken, to expose rough areas on the sides of the whiskers that can also act as electron emitters. The Applicants respectfully contend that nothing in Debe teaches or suggests that the whiskers be broken. The Applicants respectfully submit, therefore, that Debe does not remedy the noted deficiencies in the proposed combination of Xu and Dai.

The Applicants, therefore, respectfully request that this rejection be withdrawn.

35 U.S.C. § 103(a) Rejections Based On XU, DAI And KANE References

Claims 13 and 14 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Xu, in view of Dai and further in view of U.S. Pat. No. 5,191,217 to Kane et al. ("Kane"). The Applicants respectfully traverse this rejection.

With respect to claims 13 and 14, the insufficiencies detailed above regarding the proposed combination of the Xu and Dai references are equally applicable to dependent claims 13 and 14 and are incorporated by reference. The Applicants also respectfully contend that the addition of the third and fourth conducting grids, as noted by the Examiner, provide additional control over the electron emitter performance than that provided by the first two conducting grids. The Applicants respectfully contend that the claimed structure is, therefore, distinguishable from the substitution addressed in *In re Harza* in which a single wide water seal was replaced by a series of narrower ribs spaced across the same opening to provide the same function. In any event, the Applicants respectfully maintain that Kane is insufficient to remedy the noted deficiencies of the proposed combination of Xu and Dai.

The Applicants, therefore, respectfully request that this rejection be withdrawn.

35 U.S.C. § 103(a) Rejections Based On XU, DAI And MAJETICH References

Claims 17 and 18 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Xu, in view of Dai and further in view of U.S. Pat. No. 5,456,986 to Majetich et al. ("Majetich"). The Applicants respectfully traverse this rejection.

With respect to claims 17 and 18, the insufficiencies detailed above regarding the proposed combination of the Xu and Dai references are equally applicable to dependent

claims 17 and 18 and are incorporated by reference. The Applicants also respectfully contend that Majetich is directed solely to the encapsulation of magnetic metal or magnetic metal oxide nanoparticles with elemental carbon and the separation of such particles after their formation. The Applicants respectfully contend, therefore, that Majetich is not in the "relevant art" of electron emitter devices comprising composite materials with aligned, partially coated nanowires. The Applicants also respectfully submit that the Examiner has not provided the necessary "convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). Indeed, the Applicants respectfully contend that the processes described by Majetich are wholly incompatible with the catalytic growth from a thin metal catalyst film taught by Xu and Dai. Given the fundamental differences in the processes, the Applicants further contend that no one of ordinary skill could combine the references in the manner suggested with the required "reasonable expectation of success." *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

The Applicants also respectfully contest the Examiner's contention that "nanowires grown on the composite material can be segregated," Action at 7. Indeed, as taught by Xu and Dai, the carbon fibers grow from and remain fixed to the metal catalyst and cannot, therefore, be "segregated" after their formation. Given the fundamental deficiencies of the proposed combination of Xu and Dai and the general incompatibility of the Majetich teachings, the Applicants respectfully contend that the proposed combination is inadequate to support the current rejection.

The Applicants, therefore, respectfully request that this rejection be withdrawn.

Requirements For Rejections Under 35 U.S.C. § 103(a)

The Applicants respectfully note that in *In re Dembicczak*, the Federal Circuit stated that:

Measuring a claimed invention against the standard established by section 103 requires the oft-difficult but critical step of casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field.

In re Dembicczak, 175 F.3d 994, 999, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999). The Federal Circuit has also previously noted that it is improper to “use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention,” *In re Fine*, 837 F.2d 1071, 1075, 5 USPQ2d 1780, 1783 (Fed. Cir. 1988), and that the best defense against hindsight-based obviousness analysis is the rigorous application of the requirement for a showing of a teaching or motivation to combine the prior art references. See *Dembiczak*, 175 F.3d at 999, 50 USPQ2d at 1617. “Combining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor’s disclosure as a blueprint for piecing together the prior art to defeat patentability--the essence of hindsight.” *Id.*

“When a rejection depends on a combination of prior art references, there must be some teaching, suggestion, or motivation to combine the references.” *In re Rouffet*, 149 F.3d 1350, 1355, 47 USPQ2d 1453, 1456 (Fed. Cir. 1998) (citing *In re Geiger*, 815 F.2d 686, 688, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987)). The same principle applies to invalidation. “Obviousness cannot be established by combining the teachings of the prior

art to produce the claimed invention, absent some teaching or suggestion supporting the combination.” *ACS Hosp. Sys., Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). Although the suggestion to combine references may flow from the nature of the problem, *see Pro-Mold & Tool Co. v. Great Lakes Plastics, Inc.*, 75 F.3d 1568, 1573, 37 USPQ2d 1626, 1630 (Fed. Cir. 1996), “[d]efining the problem in terms of its solution reveals improper hindsight in the selection of the prior art relevant to obviousness,” *Monarch Knitting Mach. Corp. v. Sulzer Morat Gmbh*, 139 F.3d 877, 880, 45 USPQ2d 1977, 1981 (Fed. Cir. 1998). Therefore, “[w]hen determining the patentability of a claimed invention which combines two known elements, ‘the question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination.’” *In re Beattie*, 974 F.2d 1309, 1311-12, 24 USPQ2d 1040, 1042 (Fed. Cir. 1992) (quoting *Lindemann*, 730 F.2d at 1462, 221 USPQ at 488).

“There are three possible sources for a motivation to combine references: the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art.” *In re Rouffet*, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998) (Although the combination of the references taught every element of the claimed invention, absent motivation to combine the references in the manner suggested, a rejection based on a *prima facie* case of obvious was held improper.). However, the level of skill in the art cannot be relied upon to provide the suggestion to combine references, *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308, 50 USPQ2d 1161 (Fed. Cir. 1999), and “[b]road conclusory statements regarding the

teaching of multiple references, standing alone, are not ‘evidence’” sufficient to support a proposed combination, *Dembiczak*, 175 F.3d at 999, 50 USPQ2d at 1617.

The Applicants respectfully maintain that in this instance it appears that both the proposed combinations and the interpretations of the Xu, Dai and other secondary references were guided less by the actual teachings of the references than by an effort to identify claim limitations in the prior art references guided by the present claims. The Applicants further maintain that even if there was sufficient motivation to make the proposed combination, the resulting structures and materials that would be obtained by one of ordinary skill in the art the present invention would still differ materially from the claimed invention. The Applicants, therefore, respectfully request that all of the rejections under 35 U.S.C. § 103(a) be withdrawn.

Allowable Subject Matter

The Applicants note with appreciation the Examiner’s indication that claims 6-8 would be allowable if rewritten in independent form. Although, as indicated above, the Applicants maintain that the original claims 1-18 are allowable over the cited prior art references, new claims corresponding to claims 6-8 are presented as new claims 19-21.

CONCLUSION

All rejections having been addressed and overcome, the Applicants respectfully contend that the present application is now in condition for Allowance and a Notice to that effect is earnestly solicited. The Applicants respectfully note that none of the original claims have been amended and that no new prior art has been submitted via an

Information Disclosure Statement ("IDS"). Pursuant to MPEP § 706.07(a), therefore, the Applicants contend that should an additional Office Action be issued in lieu of a Notice of Allowance, that Office Action should not be designated as FINAL.

Should the Examiner feel that further discussion on any point would be helpful in advancing the prosecution of this application, the Examiner is respectfully requested to contact the undersigned.

Pursuant to 37 C.F.R. §§ 1.17 and 1.136(a), the Applicants hereby petition for a one (1) month extension of time for filing a reply to the outstanding Office Action and submit the required \$110.00 extension fee herewith.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to credit any overpayment or charge any underpayment of fees due pursuant to 37 C.F.R. §§ 1.16 or 1.17 to Deposit Account No. 08-0750.

Respectfully submitted,

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